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Science Education in the Islamic World: A Snapshot of the Role of Academies of Sciences

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Abstract

Science Education: Why? Science education is currently viewed as inadequate in the developing and developed worlds. This renders imperative the need to promote science education at all levels throughout the world, particularly in developing countries, so that people nurture their quantitative acumen, become more inquisitive and analytical, innovate and ultimately be better qualified to address development problems as well as to convert accumulated knowledge into products and services of monetary value, i. e. create wealth. A deliverable that can be achieved through a dynamic national Science, Technology and Innovation (STI) system of which science education is a major component.

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1. Introduction

Academies of sciences have a role in addressing what may be called the state of 'Science Unappreciation,' at three levels; (a) By promoting science education in schools, (b) By promoting science education and scientific research at universities, and (c) By cultivating the culture of science within society. This essay will briefly highlight some of the salient features of such a role.

1.1 Science Education: A Worldwide Interest of Academies of Sciences

At the 2000 Budapest World Conference on Science, the French academician, Pierre Lena (2004) emphasised the

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importance of education in science as a fundamental need of modern societies to achieve peace, justice and a sustainable development. It was Lena, together with Charpak (d. 2010) and Quere who, under the auspices of the Academy of Sciences of France, launched the famous science education programme called *La main a la pate* (the hands-on or the hand in the paste), which eventually became a model for the involvement of academies of sciences in science education of children at the world level (Descamps-Latscha, 2003).

In the US, the National Academy of Sciences (NAS) played a major role in developing the National Science Education Standards, which were designed to make scientific literacy a reality in the US in the 21st century (Alberts, 1995). A further turning point in the narrative of science education, and science in general in the US, came with the publication in 2007 of the famous report; *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (COSEUP, 2007). The publication addressed the S&T future of America, specifically, in the context of science education, and presented four basic recommendations which were encapsulated in catchy phrases, focused on actions in K–12 education (*10,000 Teachers, 10 Million Minds*), research (*Sowing the Seeds*), higher education (*Best and Brightest*), and economic policy (*Incentives for Innovation*) (NAP, 2010).

Described by (Park and Han, 2002) as a fundamental issue to improve the economic growth and the living standard of countries, science education is an activity to which academies should pay special attention, because according to W. C. Clark (2003), 'young people do not see science careers as a way of helping to solve social problems so they seek other professions.' Science education curriculum development has been an area that the political leadership in many countries has rightly considered as important. Cherry (1996), for example, described how (former) South African President Mandela challenged the country's academy of sciences to inspire the country's youth to seek careers in science, engineering and technology.

Some African Organisation of Islamic Cooperation (OIC) academies such as the Ugandan National Academy of Sciences (UNAS) view science education as the single most important activity in which an academy of sciences can be involved (Mugambe, 2006). Moreover, some Asian OIC academies of sciences are quite active in the domain of science education including the Academy of Science Malaysia (ASM) (Ong and Abdul Rahman, 2002).

The interest nevertheless, shown by the academies of sciences of OIC countries in promoting science education does not match that of the world's leading academies of sciences. This is disappointing as implementing activities in science education is not normally a costly endeavour, as Shamsher Ali (Bangladesh) noted at the 1999 IAS Conference;

A pond with which students in many parts of the Muslim world are so familiar can be shown to be a living laboratory containing some of the local flora and fauna. Many biological lessons can be driven home to the students by simply analysing the happenings in the pond (Ali, 2000).

1.2 Science Education and IBSE in Jordan: A Precis

Today, Jordan boasts one of the highest adult literacy rates in the Arab world, around 99% (UNESCO, 2014). With a population of over 6.5 million, it is among the region's highest spenders on education, investing more than 20.4% of its GDP on education, and boasts over 30 government and private universities. It leads in the region in terms of the number of researchers, and according to the Global Innovation Index 2014, Jordan is the fifth-most innovative economy in the Middle East, behind the United Arab Emirates, Saudi Arabia, Qatar and Bahrain (GII, 2014).

Jordan has managed to undertake important reforms in the field of education over the last three decades in many areas.

However, research carried out in 2010 to study 'Science Teachers' Perception of Educational Reform of Science Teaching in Jordan' reveals that there were a number of difficulties hindering progress in science education. These include the fact that teachers do not play a part in the reform or implementation processes and have to adhere to approved textbooks for their material. Moreover, teachers appear to suffer from the lack of appropriate in-service training (Qablan et al, 2010). Problems that is probably prevalent in other developing countries.

1.3 The Activities of the IAS in the Domain of Science Popularisation/Education?

The IAS has paid attention to cultivating a culture of science within OIC societies by organising a series of conferences – with the decision-makers of the OIC particularly in mind – on science education policy. Such activities include convening its 1991 Amman Conference on 'Science and Technology Manpower Development.' In 1999, it organised a conference on 'Science and Technology Education for Development' in Tehran (Iran) which analysed many aspects related to the promotion of science education at all levels.

To encourage the young of today to develop an appreciation of, and delve into, the scientific enterprise with confidence, the IAS publishes journals and books that depict the outstanding scientific achievements, and portray some of the towering scientists, of the golden age of Islamic science. It has also published postcards carrying the portraits and brief bio-sketches of some such personalities.

By honouring scientific achievement and identifying champions of science, the IAS cultivates public interest in the scientific enterprise. In line with this objective, young scientists and young technopreneurs have been honoured and their achievements publicised through a number of awards that the IAS has instituted.

Appreciating that an inextricable link exists between the wellbeing of science and the culture thereof in society and the realm of the history of science, the IAS organises specialized seminars and symposia with help and support of other science academies as a well as the UNESCO International Science, Technology and Innovation Centre (ISTIC) on themes emanating from the 2006 UNESCO History of Islamic Science, Engineering and Technology (HISET) Programme. The IAS has thus far convened such symposia in Malaysia, Russia and Qatar, that essentially aimed to unravel the mystery of the decline of Islamic science.

1.4 Science Education at the University Level in the Islamic World: A Precis of the Ideas discussed at IAS Meetings

In 2014, there were over 3281 universities in OIC countries (Webometrics, 2014) of which only nine were ranked among the world's 500 top universities according to the 2014 Academic Ranking of World Universities (ARWU, 2014), with King Abdulaziz University and King Saud University (both in Saudi Arabia) as well as the University of Tehran and the University of Malaya, ranked highest.

Needless to say that universities must not aim for a higher ranking as an end in itself, and ranking systems should not dictate university policy but should be used as a source of information for guiding policies that are decided according to the needs of the university's own community, traditions, market niche, and national role (Shah and Kasim, 2009).

On the other hand, as the bulk of scientific and technological research in the OIC is carried out within the higher education system[†] (Naim and Rahman, 2008) and as ranking is essentially a reflection of the state of such research, then the picture for the Islamic world here appears bleak. OIC universities are not excelling in R&D, are not succeeding in producing knowledge workers to meet the needs of the globalised economy, nor are they contributing to the national socioeconomic advancement of their countries. Despite being confronted with globalization and the ascendance of private education, new knowledge and knowledge delivery modes, the higher education system within the OIC remains supply-driven.

To address the above quandaries, the following roadmap for action is proposed for science education at the university level, within the OIC;

(a) Sustained action is required that embraces academies of sciences to advise on strategies to upgrade higher education systems in OIC countries, elevate universities in the Islamic world to world-class level and advance the higher education system in general so that; it produces quality graduates that build knowledge economies, an R&D community that can address national problems and contribute to wealth creation through knowledge creation and innovation;

(b) Universities should not be an extension of the school system! As knowledge transmitters, universities in Arab countries must aim to form highly productive, work-ready professionals and not bureaucrats. This requires admission policies of students and recruitment policies of faculty that are merit-based. The archaic hierarchical system of promotion and incentives at many OIC universities remains a hurdle;

[†] In Egypt, for example, 65% of R&D is performed within the university system (ECIDSC 2009).

(c) Research is the most salient example of a country's intellectual resources, economic strength and global competitiveness. Universities should be producers of research, not investors in research. OIC universities and research centres have been unable over the last four decades to develop a smart R&D environment. Rewarding R&D is slapdash. Faculty, often educated and trained in the west, do not implement the best research practices they picked up in the West. Lack of team spirit and comradery prevails among researchers and sabbatical leave is rarely used for research;

(d) Despite noticeable efforts of late, innovation is not yet part of the STI parlance in many parts of the Islamic world. This may be attributed to the weak linkages overall between private and public R&D, as evidenced by the low output of patents. Malaysia is the highest-ranking OIC country on the Global Innovation Index at the 33rd rank, the UAE is 36th, Saudi Arabia is 38th, Qatar is 47th, Turkey is 54th, Bahrain is 62nd, Jordan is 64th, while Yemen and Sudan are 141st and 143rd, respectively (Global Innovation Index, 2014)

(e) To generate the public's interest in the scientific enterprise, universities should introduce or reintroduce courses and programmes in the History of Science particularly in the context of the Islamic Civilisation as one means to engender appreciation of science among students. The ISTIC, the Malaysia-based centre under the auspices of UNESCO, it is worth noting, has developed such a programme and has been active in this domain for some time.

(f) To encourage high school and young university students to become inquirers rather than learners (Pritchard, 2014), philosophy must make its formal entry back into school and university curricula at universities in the Islamic world. Furthermore, departments of 'Science and Technology Studies' (only one exists in the OIC in 2014 - at the University of Malaya) should be established at some universities in the OIC, to act as think tanks of science and technology policy issues within national STI systems.

2. Conclusion

It is fair to say that a mindset of 'Science Unappreciation' exists in the Islamic world raising the prospect of a multi-fold challenge for the science education community including academies of sciences to address. Firstly, there is the question of capacity building, i.e. how do we get school teachers trained and qualified to deliver science/ science education in a clear, concise and exciting manner and indeed with the required enthusiasm? Another important challenge that must be addressed by developing countries is the language in which science subjects are taught at schools. Would it be the local language or a universal language? This gives rise to the question of the availability of books and teaching material etc. in local languages.

Secondly, how can the impact of science education strategies be assessed quantitatively and how can the impact of science education on students and societies be measured?

Thirdly, when do we move as we should from Inquiry-based science education (IBSE) to inquiry-based education (IBE)? This seems to me to be a real practical problem. For how can we ask or expect young children who have, for example, just enjoyed a non-conformist IBSE class to switch back to a traditional mode of learning in a subsequent history or language lesson, for example. Shouldn't we start thinking of turning most of our education into Inquiry-based Education (IBE)?

A roadmap of action of action is required to upgrade science teaching at universities in the OIC as part of an extensive overhaul of the higher education system within. Science education at universities cannot be viewed independently of the national STI system of countries – particularly the human resource component thereof.

Lastly, academies of sciences worldwide can play a critical role in upgrading science education at all levels by sharing experiences and promoting best practices.

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